# H01M

## PROCESSES OR MEANS, e.g. BATTERIES, FOR THE DIRECT CONVERSION OF CHEMICAL INTO ELECTRICAL ENERGY (electrochemical processes or apparatus in general C25; semiconductor or other solid state devices for converting light or heat into electrical energy H01L, e.g. H01L 31/00, H01L 35/00, H01L 37/00)

## Definition statement

*This place covers:*

Constructional details or processes of manufacture of the non active parts, e.g. casings, mountings, vents, separators, current-conducting connections, arrangements for filling or emptying cases with or of liquid.

Electrodes composed of or comprising active material, processes of manufacture and active materials thereof, e.g. electrodes for primary cells, for lead-acid accumulator.

Inert electrodes with catalytic activity, processes of manufacture and catalytic materials thereof.

Primary cells, manufacture and servicing or maintenance thereof, e.g. cells with aqueous or non-aqueous electrolyte, deferred-action cells, printed batteries

Secondary cells, manufacture and servicing or maintenance thereof, heating or cooling; temperature control, e.g. lead-acid accumulators, alkaline accumulators, accumulators with non-aqueous electrolyte

Fuel cells or their stacks and manufacture thereof, e.g. alkaline fuel cell, polymer electrolyte fuel cell, solid oxide fuel cell, biochemical fuel cells comprising enzymes as catalysts

Combination of fuel cells with means for production of reactants, e.g. with reformer or for treatment of residues

Hybrid cells, e.g. Zinc-air battery, half-cell of a fuel cell type and half-cell of a primary or secondary cell type

Structural combinations of different types of electrochemical generators.

## Relationships with other classification places

This subclass does not cover the preparations of chemical compounds as such, which subject matter is covered by classes C01 (inorganic chemistry), C07 (organic chemistry) and C08 (organic macromolecular compounds).

Specific chemical compounds for batteries and their preparation are classified in C01, C07 and C08 as well as in H01M.

Apparatus for testing electrical condition of accumulator or batteries are classified in G01R 31/36 and accumulators combined with arrangements for measuring, testing or indicating condition are classified in H01M 10/48

Electrochemical processes or apparatus otherwise than for generating energy C25

## References

### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Hybrid capacitors | H01G 11/00 |

| | |
|---|---|
| Circuits arrangements for charging or depolarising batteries or for supplying loads from batteries | H02J 7/00 |

## *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| Catalysts | B01J 23/00, B01J 25/00, B01J 27/00, B01J 31/00 |
| Disposal of solid waste | B09B |
| Working or processing of sheet metal or metal tubes | B21D |
| Casting of metals | B22D |
| Shaping of substances in a plastic state | B29C |
| Producing particular articles from plastics or from substances in a plastic state. | B29D |
| Arrangement or mounting of plural diverse prime-movers characterised by the electric storing means, e.g. batteries | B60K 6/28 |
| Arrangement or mounting of plural diverse prime-movers characterised by the fuel cells | B60K 6/32 |
| Electric propulsion using power supplied from primary cells, secondary cells or fuel cells | B60L 11/18 |
| Arrangement of batteries specially adapted for vehicles | B60R 16/04 |
| Supplying batteries to, or removing batteries from vehicles | B60S 5/06 |
| Conjoint control of vehicle sub-units of different type including control of energy storage means, e.g. batteries | B60W 10/26 |
| Conjoint control of vehicle sub-units of different type including control of fuel cells | B60W 10/28 |
| Containers or packages with special means for dispensing contents for batteries | **B65D85/88** |
| Measuring or testing processes involving enzymes | C12Q 1/00 |
| Electrodes for electrolytic processes | C25B 11/00, C25C 7/00 |
| Electrodes for electrolytic or electrophoretic process for the production of compounds or non metals | C25B 11/00 |
| Diaphragms; spacing elements for electrolytic or electrophoretic process for the production of compounds or non metals | C25B 13/00 |
| Electrodes for electrolytic production, recovery or refining of metals | C25C 7/02 |
| Diaphragms; spacing elements for electrolytic production, recovery or refining of metals | C25C 7/04 |
| Electrodes for electrolytic coating | C25D 17/10 |
| Indicating or measuring liquid | G01F 23/00 |
| Investigating or analysing materials by determining their chemical or physical properties | G01N |
| Apparatus for testing electrical condition of accumulator or electric batteries | G01R 31/36 |
| Control of temperature | G05D 23/00 |
| Electrolytes for electrolytic capacitors | H01G 9/022 |

| | |
|---|---|
| Electrolytic light sensitive devices | H01G 9/20 |
| Lithium-ion capacitors | H01G 11/06 |
| Semiconductor or other solid state devices for converting light or heat into electrical energy | H01L 31/00, H01L 35/00, H01L 37/00, H01L 51/42 |
| Electrically conductive connections | H01R |
| Conversion of dc power input into dc power output using batteries | H02M 3/18 |
| Photovoltaic modules structurally associated with energy storage means, e.g. batteries | H02S 40/38 |

## Special rules of classification

Every technical aspect of the invention is classified with inventive symbols and additional information from the description with additional symbols. When the battery or fuel cell is characterised by the combination of a specific positive electrode, specific negative electrode and/or specific electrolyte: every specific components of the combination will be classified with inventive symbols.

When a breakdown Indexing Code represents the invention , the corresponding upper group should also be given.

When the type of battery is not mentioned, the classification of the invention is done in the primary and secondary type of battery classes.

When a group for a process does not exist, it is classified within the material of the object.

Additional orthogonal Indexing Codes are used for "additional information" and are always given together with a CPC group. Classification with these codes is highly desirable, since they provide an efficient search tool when combined with a CPC group.

They concern:

H01M 2200/00 and subgroups : Safety devices for primary or secondary batteries

H01M 2220/00 and subgroups : Batteries for particular applications

H01M 2250/00 and subgroups : Fuel cells for particular applications; Specific features of fuel cell system

H01M 2300/00 and subgroups : Electrolytes

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

| | |
|---|---|
| Active materials, active masses, active liquids | materials, masses, liquids participating in the electrochemical reactions |
| Inert electrodes | Electrodes characterised by their catalytic activity |
| Primary cells | Cells, where the cell energy present in chemical form is not regenerated |
| Secondary cells, accumulator | Rechargeable cells, characterised by reversible electrochemical reactions |
| Battery | Device comprising one or more electrochemical cells |
| NTC, PTC | NTC (negative temperature coefficient) thermistors with their resistance decreasing with increasing temperature, PTC (positive temperature coefficient) thermistors with their resistance rising with increasing temperature |

| | |
|---|---|
| Redox flow battery | Reversible fuel cell in which all electroactive components are dissolved in the electrolyte with a flow circulation system of the electrolyte |
| Redox fuel cell, indirect fuel cell | Fuel cell where the oxydant or fuel is not reacted directly at the electrode but with the reduced/oxidised form of a redox couple and the oxidised/reduced species are fed to cathode/anode |

## Synonyms and Keywords

| | |
|---|---|
| Electrochemical storage device | Galvanic primary cell or secondary cell (battery, accumulator), electrochemical capacitors (in particular pseudocapacitors and hybrid capacitors |

# H01M 2/00

### Constructional details or processes of manufacture of the non-active parts

## Definition statement

*This place covers:*

- Cases, jackets or wrappings, lids or covers, carrying devices, racks, fixing devices;
- Vents plugs, mechanical arrangement for the escape of gas
- Separators, diaphragms, spacing elements;
- Current conducting connections for cells, terminals, connections for affording protection against corrosion, for preventing undesired use;
- Arrangements for filling, emptying cases with or of liquid e.g. Electrolytes, moving electrolytes.

## References

### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Constructional details or processes of manufacture of the non-active parts of fuel cells | H01M 8/00 |
| Electrically conductive connectors connecting the battery to the load, electric system | H01R |

### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| Electrotherapy, e.g. implantable medical devices | A61N |
| Separation using semi-permeable membrane | B01D 61/00- B01D 71/00 |
| Drill tools | B23B 51/00 |
| Portable power-driven tools | B25F |
| Shaping or joining plastics | B29C 43/00 |
| Container for storage | B65D |
| Devices for moving or tilting heavy load, load-carrier | B65G 7/12 |
| Making textile fabrics form fibers | D04H |
| Sealing | F16J 15/00 |

| | |
|---|---|
| Valves | F16K |

## Special rules of classification

Small-sized batteries indicate batteries used in portable devices

Large-sized batteries indicate batteries used in vehicles or standby power.

When the use of a battery can not be deduce, the classification is done in both classes.

H01M 2/02 relates to the first wall around the active parts and H01M 2/10 relates to the second wall around the battery/cell.

When the material of separator is a mixture of fibrous and non-fibrous material, it's classified in the classes of the fibrous material.

# H01M 4/00

## Electrodes (electrodes for electrolytic processes C25, {electrodes for hybrid or electric double capacitor H01G 11/22})

## Definition statement

*This place covers:*

Electrodes comprising active material for primary, secondary and hybrid cell and electrodes with catalytic activity for fuel cells.

Processes of manufacture of the electrodes, selection of substances as active materials, carriers or collectors, inactive substances as ingredients in the electrode, e.g. binder, conductive material

## Relationships with other classification places

The production of active material used in batteries is not classified in H01M but in C01B, C01D, C01F, C01G, C22C, C04B 35/00

## References

### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| General process for applying liquids to obtain a coating with specific electrical properties | B05D 5/12 |
| Processing of sheet metal | B21D |
| Casting of metals | B22D |
| Working metallic powder | B22F |
| Soldering, welding | B23K |
| Layered products | B32B |
| Nano-structures | B82B |
| Carbon | C01B 31/00 |
| Compounds of alkali metals | C01D |
| Compounds of Be, Mg, Al, Ca, Sr, Ba, Ra, Th or rare earth metals | C01F |
| Compounds of manganese | C01G 45/00 |
| Compounds of Nickel | C01G 53/00 |

| | |
|---|---|
| Shaped ceramic products | C04B 35/00 |
| Organic macromolecular compounds | C08G, C08L |
| Alloys | C22C |
| Coating metallic material, surface treatment of metallic material, e.g. vacuum evaporation | C23C, C23C 14/00 |
| Electrolytic or electrophoretic processes for the production of compounds or non-metals, electrodes for those process | C25B |
| Carbon filaments | D01F 9/12 |
| Conductors characterised by the conductive materials | H01B 1/12 |
| Magnetic materials | H01F |

## Special rules of classification

- The IPC rule concerning electrode for hybrid cells is applied
- Classification of electrode versus classification of active material (H01M 4/38-H01M 4/60) should only be given when the invention concern the combination of active material and non-active materials, information given on the different elements constituting the electrode.
- H01M 4/02 is only employed if the subject to be classified is general and does not concern the subgroups H01M 4/06, H01M 4/13, H01M 4/14, H01M 4/24
- The process of manufacture of a specific type of battery electrode is classified in H01M 4/16-H01M 4/23 or H01M 4/26-H01M 4/30 or H01M 4/139-H01M 4/1399 and in H01M 4/04-H01M 4/0428 (double classification).
- H01M 4/02 and H01M 4/04-H01M 4/0428 should not be used for fuel cell electrodes and their manufacture which are classified in H01M 4/86-H01M 4/8896
- All the steps of the process of the manufacture of an electrode (battery electrode or fuel cell electrode) should be classified if possible.
- When oxides are added in an electrode and when it' s not sure whether it's an active material or an additive, classes in H01M 4/48-H01M 4/57, H01M 4/62 and H01M 4/362 should be given
- H01M 4/366 is used for any coating (the coating being a second active material or not). In the case the coating is not a second active material, H01M 4/62 subgroup should be given.
- H01M 4/364 is only used for mixture of at least 2 active materials.
- Classification of alloys under H01M 4/38 relate to the composition before charging, e.g. before the addition of lithium.
- Electroactive polmyers classified in H01M 4/137 concern polymers where oxidation/reduction (redox) processes take place
- Electrode composed of Lithium or lithium based alloy is classified in H01M 4/134
- H01M 4/18 relates to Planté electrode process. It concerns lead dioxide generated by direct oxydation of lead that forms the conducting substrate.
- Alkaline earth metals oxides or hydroxides, oxides or hydroxides of metal other than manganese, nickel, iron, cobalt, silver, lead, mercury are classified in H01M 4/48 and if they insert or intercalate light metals, they are classified in H01M 4/485.

# H01M 4/86

### Inert electrodes with catalytic activity, e.g. for fuel cells

## Definition statement

*This place covers:*

Electrodes for fuel cells, comprising catalysts

## References

### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| Catalysts | B01J, B01J 23/38 |
| Process for preparing catalyst | B01J 37/00 |

## Special rules of classification

Catalysts supported on carbon are not classified in H01M 4/96 but in H01M 4/9083 or H01M 4/926.

H01M 4/96 is only given if carbon is the catalytic species, e.g. for hybrid cells.

H01M 4/8647-H01M 4/8657 concern composite material, meaning comprising at least 2 catalysts having the same function and H01M 4/8615 concerns bifunctional electrode used in regenerative fuel cell with oxygen reduction catalyst and oxygen evolution reaction catalyst.

All the steps of the process of the manufacture of a fuel cell electrode

should be classified if possible within subgroups H01M 4/88-H01M 4/8896

The process for making electrocatalyst are classified within the catalyst material subgroups H01M 4/90-H01M 4/923. Catalysts used only in fuel cells are not classified in B01J.

# H01M 6/00

## Primary cells; Manufacture thereof

## Definition statement

*This place covers:*

- Primary batteries with aqueous electrolyte, non-aqueous electrolyte and solid electrolyte.
- primary batteries activated by addition of electrolyte, by physical means (thermal and mechanical)
- thin film or flat or printed primary batteries
- Methods or arrangements for maintenance of primary batteries including heating or cooling, primary batteries combined with cell condition or safety devices, regeneration of reactants or electrolyte, type recognition

## References

### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| Thermoelectric solid state devices | H01L 35/00 |

## Special rules of classification

Classification for primary and secondary non aqueous batteries:

- When it concerns only primary battery : H01M 6/162-H01M 6/188
- When it concerns primary and secondary battery or in case of doubt : both subgroups are given : H01M 6/162-H01M 6/188 and H01M 10/056-H01M 10/0569
- When it concerns only secondary battery : H01M 10/056-H01M 10/0569

Solid polymer electrolyte of a battery is not classified in H01M 8/1018 unless the use in a fuel cell is mentioned.

Printed battery in H01M 6/40 concern thin film battery.

### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

| | |
|---|---|
| Primary cells | Electrochemical generators in which the cell energy is present in chemical form and is not regenerated |

## H01M 8/00

### Fuel cells; Manufacture thereof

### Definition statement

*This place covers:*

Fuel cells or their stacks that can include:

- Collectors, separators, interconnectors, gas diffusion layer.
- Sealing or frame, its processes and materials.
- Membranes, matrices holding electrolytes solutions or melts.
- Means for temperature measurement or control, for reactant control or regulation.
- Methods for controlling fuel cells or fuel cell systems with detection and regulation of variables.
- Combination of fuel cells with means for production of reactants (e.g. with a reformer) or for treatment of residues.
- Types of fuel cell: with aqueous electrolytes (e.g. alkaline fuel cells), with solid electrolyte at low temperature (below 200-250°C) (e.g. polymer electrolyte fuel cells), with solid electrolyte at high temperature (e.g. solid oxide fuel cells), with molten electrolyte, biofuel cells/biochemical fuel cells comprising enzymes as catalysts.
- Manufacture thereof.

### References

#### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| Constructional details, or processes of manufacture, of the non-active parts of cells other than fuel cells | H01M 2/00 |
| Separation of gases or vapour | B01D 53/00 |
| Semi-permeable membranes | B01D 67/00, B01D 69/00, B01D 71/00 |
| Catalysts | B01J 23/00, B01J 25/00, B01J 27/00, B01J 31/00 |
| Recycling of heat from fuel cell to other parts of a car | B60H 1/00278 |
| Fuel cells used to drive air conditioning | B60H 1/00428 |
| Prime movers consisting of electric motors and internal combustion engines characterised by the fuel cells | B60K 6/32 |
| Electric propulsion using power supplied from fuel cells | B60L 11/18 |
| Conjoint control of vehicle sub-units of different type including control of fuel cells | B60W 10/28 |
| Arrangement or adaptations of fuel cells in cosmonautic vehicles | B64G 1/423 |

| | |
|---|---|
| Hydrogen; Gaseous mixtures containing hydrogen; Separation of hydrogen from mixtures containing it; Purification of hydrogen | C01B 3/00 |
| Shaped ceramic products (e.g. for use in solid oxide fuel cells) | C04B 35/00 |
| Manufacture of shaped structures of ion-exchange resins | C08J 5/20 |
| Production of combustibles gases containing carbon monoxide from solid carbonaceous fuels | C10J 3/00 |
| Liquid carbonaceous fuels | C10L 1/00 |
| Micro-organisms or enzymes | C12N |
| Measuring or testing processes involving enzymes | C12Q 1/00 |
| Diaphragms or spacing elements for electrolytic or electrophoretic process for the production of compounds or non-metals | C25B 13/00 |
| Diaphragms or spacing elements for electrolytic production, recovery or refining of metals | C25C 7/04 |
| Vessels for containing or storing compressed, liquefied or solidified gases | F17C |
| Burners for combustion of a gas | F23D 14/00 |
| Gas-turbine combustion chambers | F23R |
| Electrochemical sensors | G01N 27/26 |
| Apparatus for testing electric properties | G01R 31/00 |
| Control of temperature | G05D 23/00 |
| Electrolytes for electrolytic capacitors | H01G 9/022 |
| Hybrid capacitors | H01G 11/00 |
| Semi-conductor or other solid state devices for converting light or heat into electrical energy | H01L 31/00, H01L 35/00, H01L 37/00, H01L 51/42 |
| Electrically conductive connections | H01R |

## Special rules of classification

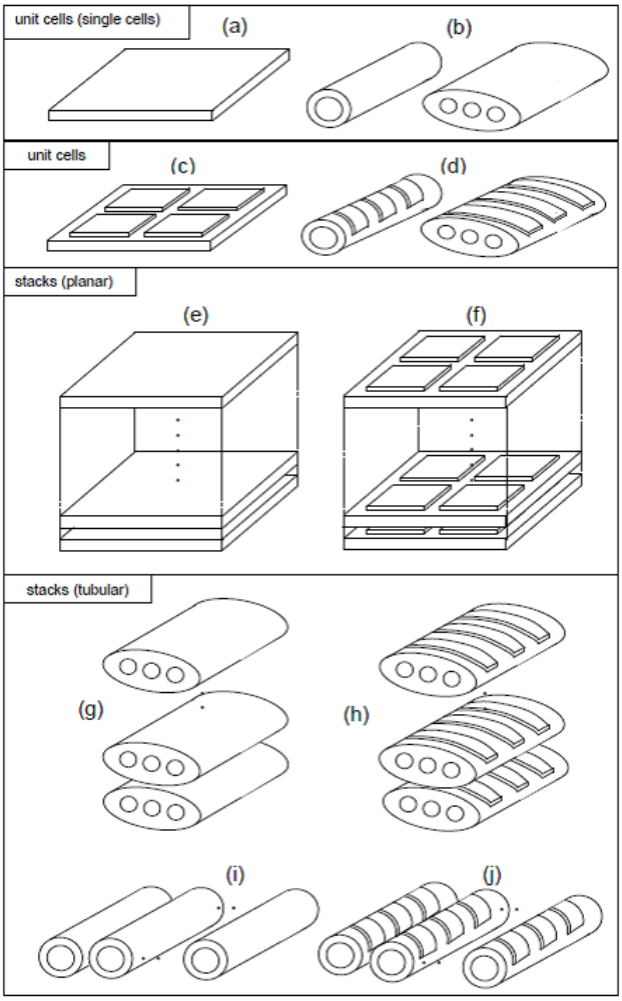
- Electrodes for fuel cells are classified in H01M 4/86- H01M 4/98.
- Membranes for immobilising electrolyte solutions or electrolyte melts are classified in H01M 8/0289-H01M 8/0295 and membranes used as support or mixed with polymer electrolytes are classified in H01M 8/1058-H01M 8/1062.
- Means for control of temperature, pressure, reactant, and electrolyte are classified in subgroups H01M 8/04007-H01M 8/04291 and methods for controlling fuel cells or fuel cell systems are classified in H01M 8/04298-H01M 8/04992.
- Reactant in a fuel cell is only what is delivered immediately to the fuel cell, e.g. liquid methanol is evaporated to gaseous methanol that is used then in a fuel cell; only H01M 8/04089 will be used.
- Means for preventing methanol crossover (gaseous or liquid methanol) are classified in H01M 8/04197.
- H01M 8/04119 concerns the humidification in the fuel cell.
- H01M 8/04291 is used for water management of the fuel cell system.
- Rules for H01M 8/04298-H01M 8/04992.
- When the claims refer to control and/or process/management of the fuel cell, then group symbols in H01M 8/04298-H01M 8/04992 should be given and it's the description and claims (if they are clear) that are classified. Every variable really disclosed/claimed and not just listed as part of a whole list should be classified.
- If only general details are given in the detected and/or regulated variables, then the upper groups H01M 8/04313 and/or H01M 8/04694 should be given.

- When control/management is detailed only in the description, then classification symbols from H01M 8/04298-H01M 8/04992 should be given as additional symbols.
- When the control of a fuel cell concerns the detection/measurement of environmental variables (e.g. temperature, pressure, humidity of the environment), classification in the group H01M 8/0432 should be given if it concerns the detection of ambient temperature or in the group H01M 8/0438 if it concerns ambient pressure.
- In a system with means for production of reactants or treatment of reactants or residues, if the fuel cell aspect is not the invention (only mentioned in the description or the last (sub)claim), the document should only be classified with an additional symbol H01M 8/06.
- If the fuel cell in combination with the other means is the invention, then it is classified as invention in the subgroups under H01M 8/06.
- H01M 8/188 is only allocated for redox flow battery or secondary fuel cells, the redox couple being reversible or regenerated.
- H01M 8/20 is only used for fuel cells with redox couple being irreversible.
- H01M 8/24 subgroups are used when the invention concerns the stack of fuel cells as such.
- The symbols H01M 8/083, H01M 8/086, H01M 2008/1095, H01M 2008/128, H01M 2008/1293, and H01M 2008/147 should be used for further classification to indicate the type of fuel cell.
- Figures (c), (d) correspond to the group H01M 8/2428, figures (e), (f) correspond to the group H01M 8/2432, and figures (g), (h), (i), (j) correspond to the group H01M 8/243.
- Moreover, figure (f) also corresponds to the group H01M 8/2428 and figures (h), (j) also correspond to the group H01M 8/2428 if the emphasis of the invention is on the arrangement of the unit cells on a support.

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

| | |
|---|---|
| Porous separator | gas diffusion layer |
| Separator | bipolar plate, interconnector |
| Fuel cell | Electrochemical generator wherein the reactants are supplied from outside |
| Single cell | Fuel cell entity, containing one single anode, one single electrolyte and one single cathode [see figure: (a), (b)] |
| Unit cell | Structural component, containing one or more single cells [see figure: (a), (b), (c), (d)] |
| Stack | Group of components, where the components (unit cells) are arranged in vertical direction [see figure: (e), (f), (g), (h)] and/or horizontal direction [see figure: (i), (j)] |
| Battery | Device comprising one or more electrochemical cells |
| Redox flow battery | Reversible fuel cell in which all electroactive components are dissolved in the electrolyte with a flow circulation system of the electrolyte |

| | |
|---|---|
| Redox fuel cell, indirect fuel cell | Fuel cell where the oxidant or fuel is not reacted directly at the electrode but with the reduced/oxidised form of a redox couple and the oxidised/reduced species are fed to cathode/anode<br>**Figure:**<br>  <br> |

## Synonyms and Keywords

*In patent documents, the following abbreviations are often used:*

| | |
|---|---|
| PEFC | Polymer Electrolyte Fuel Cell |
| PEMFC | Proton Exchange Membrane Fuel Cell or Polymer Electrolyte Membrane Fuel Cell |
| SOFC | Solid Oxide Fuel Cell |
| AFC | Alkaline Fuel Cell |
| MCFC | Molten Carbonate Fuel Cell |
| DMFC | Direct Methanol Fuel Cell |
| PAFC | Phosphoric Acid Fuel Cell |
| MEA | Membrane Electrode Assembly |

*In patent documents, the following words/expressions are often used as synonyms:*

- redox flow battery, regenerative fuel cell, and secondary fuel cell

## H01M 8/06

### Combination of fuel cells with means for production of reactants or for treatment of residues (regenerative fuel cells H01M 8/18)

#### Special rules of classification

The combination of fuel cell with means for production of reactants, e.g. reformer or for treatment of residues, e.g. removal of sulfur will be classified in H01M 8/06 subgroups.

If the invention concern specifically the mean associated with the fuel cell, the means is classified and the aspect of the combination of the fuel cell with that mean is classified in H01M 8/06 subgroups as additional symbol.

Temperature control means of a system combining fuel cell and for example a reformer will be classified in H01M 8/06 subgroups, H01M 8/04298 subgroups and in C01B 3/02 subgroups if the temperature control concerns the reformer.

Every means in a combination system will be classified as invention or additional symbol according to the specific aspect of the invention, e.g. emphasis on the system or on a specific mean.

## H01M 8/0618

### {Reforming processes, e.g. autothermal, partial oxidation or steam reforming}

#### Relationships with other classification places

Reformers are classified in C01B 3/02 subgroups

#### Special rules of classification

In a system comprising fuel cell and reformer, if the invention concerns only the reformer, the reformer will be classified in C01B 3/02 subgroups and the fuel cell (minor aspect) will be classified with H01M 8/06 as additional symbol.

If the invention concerns the whole system, then the invention is classified in H01M 8/06 subgroups.

## H01M 10/00

### Secondary cells; Manufacture thereof

#### Definition statement

*This place covers:*

Construction in general.

Several types of secondary batteries : lithium batteries, lead acid batteries, alkaline batteries, high temperature batteries.

Methods or arrangements for servicing or maintenance.

Cooling, heating, regulating temperature.

Recycling.

## Relationships with other classification places

Circuits for charging or depolarising or for supplying loads from batteries are classified in H02J 7/00-H02J 7/36 and the methods for charging or discharging are classified in H01M 10/44-H01M 10/445.

Measuring electric variables are classified in G01R 31/36 if the measurement device is not structurally combined with the battery

Air conditioner of a car classified in B60H is also classified under H01M 10/60-H01M 10/667 if it's used for cooling/heating a battery.

## References

### *Informative references*

*Attention is drawn to the following places, which may be of interest for search:*

| | |
|---|---|
| Heating, cooling or ventilation devices in vehicles | B60H, B60H 1/00278 |
| Arrangement of electric storage means for propulsion | B60K 1/04 |
| Prime movers consisting if electric motors and internal combustion engines | B60K 6/28, |
| Vehicles using power form primary cells, secondary cells or fuel cells | B60L 11/18 |
| Arrangement of batteries in a vehicle | B60R 16/04 |
| Supplying batteries to, or removing batteries from vehicles | B60S 5/06 |
| Specific uses or applications of nano-structures | B82Y |
| Electrochemical actuator | F03G 7/005 |
| Heat exchange or heat transfer apparatus | F28B, F28C, F28D, F28F |
| Indicating or measuring liquid in general | G01F 23/00 |
| Investigating fluid tightness of structure | G01M 3/00 |
| Measuring density | G01N 9/00 |
| Investigating or analysing materials by the use of electric, electrochemical or magnetic means | G01N 27/26 |
| Control of temperature in general | G05D 23/00 |
| Arrangement for obtaining electrical energy form radioactive source | G21H 1/04 |
| Semi-conductors devices | H01L |
| Generators in which kinetic energy is converted into electrical energy | H02N 3/00 |
| Portable receivers and arrangement for mounting batteries or batteries chargers | H04B 1/3883 |
| Portable phone with battery compartment | H04M 1/0262 |
| Printed circuits | H05K |

## Special rules of classification

- Small-sized batteries indicate batteries used in portable devices
- Large-sized batteries indicate batteries used in vehicles or standby power.
- Construction classes under H01M 10/12, H01M 10/28, H01M 10/058, H01M 10/38 take precedence over H01M 10/04.
- For non aqueous secondary battery, a class indicating the type of battery, e.g. H01M 10/052 should always be given in addition to the classes related to construction

H01M 10/058-H01M 10/0587 or to the classes related to the type of electrolyte H01M 10/056-**H01M10/0659**.

- Solid polymer electrolyte of a battery is not classified in H01M 8/1018-H01M 8/1093 unless the use of this polymer in a fuel cell is indicated.
- Special rules for the subgroups H01M 10/42-H01M 10/488
- Additives in electrolyte having the function of safety are classified in H01M 10/0567 for example and also in H01M 10/4235. Fusing, polymerising additives are also classified in H01M 10/4235.
- Structurally combination indicates attached to the battery or in the battery housing.
- Printed circuits integrated to the outside of the casing of the battery, e.g. on the cover) are classified in H01M 10/425
- H01M 10/4257 concern battery with incorporated memory, microchip, electronic circuit inside the housing of the cells or batteries.
- The use of printed circuit as a casing of a battery is classified in H01M 2/10.
- Apparatus for testing the cell or battery and not incorporated with the battery is classified in H01M 10/4285
- The regeneration of electrolyte or reactants done by non electrical means is classified in H01M 10/4242
- Any ratio between electrode/electrolyte, anode/cathode of a secondary battery is classified in H01M 2010/4292
- Removing gas inside the battery by water recombination is classified in H01M 10/52.
- Gel electrolytes are double classified in H01M 10/0565 if they concern gel-type polymeric material for non-aqueous accumulator and H01M 2300/0085

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

| | |
|---|---|
| Accumulator | secondary battery |
| Secondary cells | Accumulators receiving and supplying electrical energy by means of reversible electrochemical reactions |

# H01M 12/00

### Hybrid cells; Manufacture thereof

## Definition statement

*This place covers:*

hybrid cells, e.g. :

- half cell of capacitor type and half-cell of primary or secondary battery type
- half cell of fuel cell type and half cell of primary or secondary cell type

## Relationships with other classification places

Hybrid capacitors are classified in H01G 9/155

## Special rules of classification

- If the invention concern electrodes, classes of fuel cell electrodes (H01M 4/86-H01M 4/98) and/or battery electrodes (H01M 4/02-H01M 4/84) are given in combination with the Indexing Code of the hybrid cells.
- The casing and the lid of the hybrid cells are classified in H01M 2/0255 and H01M 2/0452 respectively.

- Methods or arrangements for servicing or maintenance are classified in H01M 6/50 or H01M 10/42 according to the type of half battery cell. The control of half fuel cell type is classified under H01M 8/04298-H01M 8/04992.
- All hybrid cell concerning half capacitor, half battery should be circulated to H01G.

### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

| | |
|---|---|
| Hybrid cells | Electrochemical generators having two different types of half-cells, the half-cell being an electrode-electrolyte combination of either a primary, a secondary, or a fuel cell |

## H01M 14/00

### Electrochemical current or voltage generators not provided for in groups H01M 6/00 - H01M 12/00; Manufacture thereof

### Definition statement

*This place covers:*

Every type of electrochemical cell that is not classified in the above groups.

Photoelectrochemical storage cells wherein the light causes a change in chemistry and the energy is stored and discharged at later stage.

### Relationships with other classification places

Solar cells are classified in H01G 9/20 and only if the energy produced by the solar cell is stored then it will be also classified in H01M 14/005.

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Light sensitive devices (photocells) | H01G 9/20 |

### Synonyms and Keywords

*In patent documents, the following words/expressions are often used as synonyms:*

- "photocells", "photoelectrochemical cells (PEC)", "photovoltaic cells" and "solar cells"

## H01M 14/005

### {Photoelectrochemical storage cells (light sensitive devices H01G 9/20, semiconductors sensitive to light H01L 31/00)}

### Definition statement

*This place covers:*

Photoelectrochemical storage cells wherein the light causes a change in chemistry and the energy is stored and discharged at later stage.

## Relationships with other classification places

This group does not cover solar cells, photocells, photoelectrochemical cells or photovoltaic cells which are covered by the following groups:

- Semiconductor devices sensitive to light and adapted for the conversion of the energy of such radiation into electrical energy are covered by group H01L 31/00
- Solid-state devices using organic materials as active part specially adapted for sensing light and adapted for the conversion of the energy of such radiation into electrical energy are covered by group H01L 51/42
- Electrolytic light sensitive devices, e.g. dye-sensitised solar cells, are covered by group H01G 9/20
- Photovoltaic modules structurally associated with energy storage are covered by group H02S 40/38

## References

### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Electrolytic light sensitive devices | H01G 9/20 |
| Semiconductor devices sensitive to light | H01L 31/00 |
| Solid-state devices using organic parts specially adapted for sensing light | H01L 51/42 |
| Photovoltaic modules structurally associated with energy storage | H02S 40/38 |

# H01M 16/00

## Structural combinations of different types of electrochemical generators

## Definition statement

*This place covers:*

Association of fuel cells with other electrochemical generators, e.g. fuel cell + electrolysers, fuel cell+ battery, fuel cell + capacitor

## References

### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Combination of secondary battery with capacitor | H01M 10/4264 |

# H01M 16/003

## {of fuel cells with other electrochemical devices, e.g. capacitors, electrolysers}

## Definition statement

*This place covers:*

Association of fuel cells with other electrochemical generators, e.g. fuel cell + electrolysers, fuel cell+ battery, fuel cell + capacitor